Development and Validation of Social Motivation Questionnaire

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Research Design and Methods: Ten items were selected from a pool as the candidate items of SMQ and were administered to 480 German adults (20 to 91 years old) for validation. These items were also administered to 150 U.S. (18 to 40 years old) and 131 Hong Kong younger adults (18 to 26 years old) for cultural-invariance examination.

Results: Exploratory and confirmatory factor analyses showed that a two-factor, eight-item structure fit the German adults' data well with satisfactory reliability. Multigroup comparisons showed cross-age invariance among younger, middle-aged, and older German adults, as well as cross-cultural invariance among German, U.S., and Hong Kong younger adults.

Discussion and Implications: A new questionnaire, SMQ, was developed and validated to measure IS and ER social motivation across adulthood and across cultures.

Key words: Social motivation; information seeking; emotion regulation; cross-cultural invariance

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Introduction

Social interaction is a core part of human life, and it strongly relates to individuals' health and well-being (Cohen, 2004; House, Landis, & Umberson, 1988; Pinquart & Sörensen, 2000). How social interaction changes across the lifespan is of growing interest. Research has suggested that these changes may result from an age-related shift in social motivations—younger adults focus more on information seeking (IS) whereas older adults focus more on emotion regulation (ER) (Carstensen, 1995, 2006). The current study aims to develop a questionnaire to capture these two types of social motivation.

Age-related Changes in Social Interaction

The aging literature documents several changes regarding social interaction across adulthood, including changes in social network size, social selectivity, and quality of social relationships (Jiang, Chan, Lu, & Fung, 2015). First, advanced age is usually accompanied by a shrinkage in size of social networks, particularly the peripheral social network consisting of emotionally distant others (Cornwell, Laumann, & Schumm, 2008; Holtzman et al., 2004; Lang & Carstensen, 1994, 2002; Zhang, Yeung, Fung, & Lang, 2011). The size of the core social network, consisting of emotionally close others, however, is typically preserved with age (Antonucci, Akiyama, & Takahashi, 2004; Fung, Carstensen, & Lang, 2001; Smith et al., 2015; Zhang et al., 2011). Moreover, compared to younger adults, older adults prefer interacting with emotionally close, rather than distant, others (Lang, Wagner, Wrzus, & Neyer, 2013; Yeung, Fung, & Lang, 2008). These phenomena indicate that advanced age is associated with enhanced selectivity in social interaction (Zhang et al., 2011).

Moreover, the quality of social relationships generally improves with age. Older adults experience more positivity (English & Carstensen, 2014) and less negativity (Luong, Charles, & Fingerman, 2011) in social relationships compared to younger adults. For example, older adults report fewer interpersonal problems (Birditt & Fingerman, 2003; Fingerman, Hay, & Birditt, 2004) and negative affect (Akiyama, Antonucci, Takahashi, & Langfahl, 2003; Birditt, Fingerman, & Almeida, 2005; Charles & Piazza, 2007; English & Carstensen, 2014).

Age-related Changes in Social Motivations

What causes age-related changes in social interaction? Socioemotional selectivity theory (SST) (Carstensen, 2006; Carstensen, Isaacowitz, & Charles, 1999) ascribes these changes to age-related motivational changes. According to SST, life goals and motivations are prioritized depending on future time perspective (FTP). People tend to prioritize future-oriented goals (e.g., to accumulate information and social resources) when FTP is expansive and open-ended, but prioritize present-oriented goals (e.g., to pursue emotional meaningfulness and satisfaction) when FTP is constrained and limited. Later in life, future time is typically perceived as increasingly limited, which strengthens individuals' ER motivation to pursue emotional goals. To attain emotional goals, older adults allocate more resources to process emotional information (particularly positive information) and regulate emotions (Carstensen, Fung, & Charles, 2003; Carstensen et al., 1999).

The age-related transition of motivational focus from IS to ER cast broad impacts over individuals' cognitions and behaviors, which contribute to maintaining or enhancing emotional well-being across adulthood (e.g., Jiang et al., 2015; Reed & Carstensen, 2012). With regard to cognition, a widely known phenomenon is the age-related positivity effect: older adults show relatively more preference for positive over negative information compared to younger adults

(Kennedy, Mather, & Carstensen, 2004; Reed & Carstensen, 2012). The phenomenon has been identified in a wide range of cognitive tasks including attention, different types of memory, judgment, and decision making (e.g., Reed & Carstensen, 2012).

It is also widely acknowledged that the age-related transitions in motivation impact individuals' social behaviors. For example, Lang and Carstensen (2002) showed that older adults, compared to younger adults, had more limited FTP and prioritized ER goals, which were associated with smaller social networks, more relatives and fewer socially distant others in the networks, and higher levels of satisfaction with social relationships. In another study, Fung, Carstensen, and Lutz (1999) found that older adults preferred emotionally close social partners more than younger adults. However, the age difference vanished when both age groups were experimentally manipulated to perceive future time in the same manner. To be specific, the two age groups displayed a similar preference for emotionally close social partners when they were asked to imagine a limited future, and this preference disappeared when both groups were asked to imagine an expansive future. These studies have demonstrated the roles of FTP and age-related motivational changes in social interaction.

The Current Study

Although it has been widely assumed that age-related changes in social interaction may arise from the transition from greater IS to greater ER motivation, few studies have ever directly measured and examined the roles of these motivations. Such a measure is desired for tests of the roles that IS and ER motivation play as asserted by SST (e.g., Carstensen, 1995), as well as for future studies to better understand the mechanisms underlying age-related changes in social goals and behaviors. The measure may also help researchers evaluate the effectiveness of interventions targeting social motivation that aim to change individuals' social goals and behaviors.

To close this gap, the current study developed and validated the Social Motivation Questionnaire (SMQ) for gauging individuals' IS and ER motivation during social interaction. The questionnaire was generated and first validated with data from a German sample. Then, to examine the generalizability of the questionnaire, we also tested for its structural invariance across age groups (younger, middle-aged, and older adults) and across cultures (German, the US, and Hong Kong).

Method

Generation of SMQ Items

A pool of 18 items in German was generated to assess perceived functions of seeking social contact and spending time with people according to the SST (Carstensen, 1995). The items were generated in accordance with the suggestions of guidelines for questionnaire development (e.g., Artino Jr, La Rochelle, Dezee, & Gehlbach, 2014; Hinkin, 1998). For example, all items were written to be short, simple, and in language familiar to both younger and older adults. No reverse-scored items were generated as growing literature has reported problems with such items (e.g., for a review see Tsang, Royse, Terkawi, 2017).

To ensure the questionnaire's content validity, all items were evaluated and screened by a panel of experts (Artino Jr et al., 2014; Polit & Beck, 2006) according to how well the items reflect ER and IS motivation in social relationships. Eight items were excluded as all experts agreed that these items did not accurately or univocally reflect ER or IS motivation, and the remaining ten items were included in the analyses (see **Table 1**). Ten items should be sufficient in number to measure the two types of social motivation, as suggested by Artino Jr et al. (2014) that six to ten items usually suffice in reliably capturing narrowly defined constructs.

These items were also translated into English and Chinese for examination of cross-cultural invariance. According to procedures recommended in the guidelines (Guillemin, Bombardier, & Beaton, 1993; Tsang et al., 2017), the items were translated and back-translated by fully bilingual speakers, and conflicts were resolved by consensus. The translated versions of the items were administered to the US and Chinese participants, respectively.

Participants

After generation of the items with content validity, it is necessary to collect data from respondents to further examine the validity of the questionnaire, including its reliability, structural validity (and structural invariance across groups), and construct validity (Artino Jr et al., 2014; Tsang et al., 2017).

The main dataset was collected from 480 German adults in Berlin, including 160 young adults (50% female; age in year M = 30.7, SD = 5.7, range = 20 ~ 40; education in year M = 13.9, SD = 2.4), 160 middle-aged adults (50% female; age in year M = 55.7, SD = 5.8, range = 45 ~ 65; education in year M = 12.9, SD = 3.0), and 160 older adults (50% female; age in year M = 80.7, SD = 5.9, range = 70 ~ 91; education in year M = 12.2, SD = 2.9). Gender ratio was the same among the three age groups, and younger adults had significantly more years (about one year) of education than middle-aged and old adults, $F(1, 477) = 15.75$, $p < .001$, partial $\eta^2 = .06$. For more information of the sample, please refer to Lang and colleagues' published papers (Lang & Carstensen, 2002; Lang & Heckhausen, 2001). Collection of the German data was approved by the Ethics Committee at the Medical Faculty, Free University of Berlin.

Data from a US sample and a Hong Kong sample were used to examine the structural invariance of SMQ across cultures. The US sample consisted of 150 young Americans (about 53.0% female; age in years M = 21.9, SD = 5.3, range = 18 ~ 40) from Stanford, California and

Nashville, Tennessee. The Hong Kong sample consisted of 131 young Chinese (about 62.0% female; age in years M = 20.1, SD = 1.76, range = 18 ~ 26) from Hong Kong. Collection of the US data was approved by the Stanford University and Vanderbilt University Institutional Review Boards, and collection of the Hong Kong data was approved by the Survey and Behavioral Ethics Committee, Chinese University of Hong Kong.

Test of Reliability and Structural Validity

Reliability of a questionnaire can be examined by calculating its Cronbach's alpha (Cronbach, 1951) or McDonald's omega coefficient (McDonald, 1999) based on participants' data. McDonald's omega (McDonald, 1999) was used in the current study, as it has been demonstrated to be a better measure of internal consistency (i.e., reliability), compared to Cronbach's alpha (Cronbach, 1951). It is also not constrained by assumptions (e.g., the tau-equivalent assumption), which are prerequisites of Cronbach's alpha (e.g., for a review see Dunn, Baguley, & Brunsden, 2014).

To examine structural validity of the questionnaire, exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) were conducted (Artino Jr et al., 2014). The purpose of EFA was to check whether an exploratory approach would yield the expected two-factor (i.e., IS and ER motivation) structure from the data. EFA was performed with SPSS24.0 on the scores of all ten items from a random split-half of the German sample (N = 238). Factors were extracted via principal component analysis (PCA) with varimax rotation. The number of factors was determined by eigenvalue (> 1) and scree plots. An item would be removed if its loadings were too low (< .40) on all the factors or if its loadings were higher than .40 on two or more factors (i.e., the cross-loading problem).

After the expected two-factor structure had been obtained for the questionnaire by EFA, CFA was conducted with EQS6.1 (Bentler, 1995) on the other split-half German sample (N = 238). Goodness-of-fit of the structural equation models was evaluated by relative Chi-square (χ^2 /*df*), Bentler-Bonett non-normed fit index (NNFI), comparative fit index (CFI), and root-mean-square error of approximation (RMSEA). The criteria of $\chi^2/df < 3$, NNFI > .90, CFI > .90, and RMSEA < .08 were adopted for good model fit (Hair, Anderson, Babin, & Black, 2010; Hoyle, 1995).

Moreover, we also conducted multigroup CFAs to examine invariance of the factorial structure (Asparouhov & Muthén, 2014) across ages (with younger, middle-aged, and older German adults) and across cultures (with younger German, US, and Hong Kong adults). First, measurement invariance was assessed by examining whether factor loadings were equivalent across groups. Second, structural invariance was assessed by examining whether variances of factors and covariances between factors were equivalent across groups. To examine equivalence of the factor loadings, variances, and covariances, models with these parameters constrained to be equal across groups were compared to models with these parameters freely estimated, and differences in χ^2 were used to determine which models were preferable (Cheung & Rensvold, 2002).

Test of Construct Validity

Construct validity is usually evaluated with discriminant validity and convergent validity (Cronbach & Meehl, 1955; Tsang et al., 2017). We assessed the discriminant and convergent validity of the questionnaire by examining its correlations with other variables in the German sample. For discriminant validity, we expected that social motivations would not be significantly related to variables such as education, income, physical health, and life satisfaction.

For convergent validity, we expected that social motivations would significantly relate to age, FTP, core social network size, and emotional well-being (indexed by depressive symptoms in the current study) as suggested by SST (Fung et al., 1999; Lang & Carstensen, 2002). Here we considered both summary scores for each type of social motivation (i.e., IS and ER motivation) and the difference between these two scores (i.e., ER minus IS). The ER-IS difference was included to capture the *relative weight* of ER motivation in comparison with IS motivation, with higher values indicating greater weighting of ER motivation. As asserted in SST, IS and ER motivation coexist, but the former is more prioritized among younger adults and the latter more prioritized among older adults (Carstensen, 1995; Lang & Carstensen, 1994). Thus, what determines age differences in social interaction is the relative prioritization of one type of motivation over the other, rather than the respective absolute weights of these motivations.

Measures for Construct Validation

As described above, to examine the discriminant and convergent validity of the questionnaire, we measured the following variables in the German sample: demographics (age, education, and income[1]), physical health, depression, life satisfaction, social network size, quality of social relations (including social satisfaction and negative social support), and FTP.

In brief, physical health was assessed with the somatization scale of the Symptom Checklist-90-R (SCL-90-R; Derogatis & Cleary, 1977), with higher scores indicating more somatic complaints. Depression was evaluated with Center for Epidemiologic Studies Depression Questionnaire (CES-D) (Radloff, 1977), with higher scores indicating more depressive symptoms. Life satisfaction was assessed with items from the Philadelphia Geriatric

[1] Income was log transformed as previous studies (e.g., Easterlin, 2001) did, because the distribution of income is usually skewed.

Morale Questionnaire (PGMS; Lawton, 1975), with higher scores indicating higher levels of satisfaction.

Social network size was assessed with the circle-diagram method (Antonucci & Akiyama, 1987) measuring the numbers of very close, close but not "quite so close," and less close but still important social partners. Social satisfaction was evaluated by asking participants to rate how satisfied they were with their social partners in general, and how satisfied they were with their family and relatives on a rating scale ranging from 1 (very dissatisfied) to 5 (very satisfied) (Lang & Carstensen, 2002). Negative social support was measured by a scale of negative social exchanges with social partners, with higher scores indicating higher levels of negativity (Lang & Heckhausen, 2001).

FTP was measured by the Future Time Perspective Scale (FTPS; Carstensen & Lang, 1996; Rohr, John, Fung, & Lang, 2017). FTPS was developed within the theoretical framework of SST to measure the open-endedness of FTP. A more open-end FTP means that one perceives his or her future time as more extensive, less constrained, and with more opportunities. FTPS consists of 10 items, and participants rated the degree to which they agreed with each item on a 5-point Likert scale (1 = "very agreed" to 5 = "not at all"). Sample items are "My future seems infinite to me," "I have the sense that time is running out," and "Many opportunities await me in the future." There is a debate on whether FTPS captures a one-factorial or multiple-factorial structure (e.g., Rohr et al., 2017). The one-factorial structure (Carstensen & Lang, 1996) was adopted in the current study. The scale was transformed into *T* scores, with a higher score indicating a more open-ended FTP.

Results

Structure and Reliability of the Questionnaire

EFA was conducted on a random split-half sample (N =238) of the German data to examine the structure of the questionnaire. The Kaiser-Meyer-Olkin value was .77 and Bartlett's Test of Sphericity was significant ($p < .001$), indicating that this sample fulfilled the criteria for EFA (Hair, Anderson, Tatham, & Black, 2006). The results showed that the ten items were loaded on two factors, which accounted for 33.53% and 12.57% of the total variance, respectively. However, as shown by Structure 1 in **Table 1** (only factor loadings larger than .40 are presented), there was a cross-loading problem—item 3 ("It is important to me to be able to express my feelings without offending others") and item 8 ("I seek out people who stimulate me to think about new things") loaded on both factors. It implies that participants might think that expressing feelings without offending others and interacting with inspiring people were important for both of their IS and ER goals. We thus removed these two items and rerun EFA. We obtained Structure 2 in **Table 1**, in which two factors explained 32.87% and 15.70% of the total variance, respectively. Item 1, 4, 6, and 9 loaded on factor 1 (i.e., IS motivation), and item 2, 5, 7, and 10 loaded on factor 2 (i.e., ER motivation). The results supported the expected two-factor structure of the questionnaire. McDonald's omega was .77, .75, and .67 for the entire scale, the IS subscale, and the ER subscale, respectively, indicating satisfactory reliability of the questionnaire.

----------Insert Table 1 here----------

Structural Validity of the Questionnaire

CFA on the two-factor, eight-item structure (as displayed in **Figure 1**) of the questionnaire was performed for the other random split-half German sample ($N = 238$). Indices of goodness-of-fit, $\chi^2 = 20.29$, $df = 19$, relative Chi-square (χ^2/df) < 3 $p = .38$; NNFI = .99, CFI = .99, RMSEA = .02. The modification indices showed no need to add covariances between the errors of the items. The results indicated a sound fit of the model to the data, confirming the validity of the two-factor, eight-item structure of the questionnaire.

----------Insert Figure 1 here----------

Invariance of Factorial Structure across Ages

We first conducted CFAs for the young, middle-aged, and older German adults separately. As displayed in **Table 2**, indices showed good model fit in all the age groups, indicating the same configural pattern (i.e., a common two-factor, eight-item structure) across ages.

We then tested for measurement invariance across age groups by comparing the model with factor loadings freely estimated (Model 1) with the model with factor loadings constrained to be equal across age groups (Model 2). As shown in **Table 3**, both models fit the data quite well. Comparison between these two models showed that constraints of factor loadings did not significantly worsen the goodness of fit, $\Delta\chi^2 = 8.72$, $\Delta df = 12$, $p > .05$. The results suggested that Model 2 was preferred over Model 1, revealing cross-age measurement invariance of the two-factor, eight-item structure, i.e., the pattern of relationship between items and factors was equivalent across age groups.

To test cross-age structural invariance, we further constrained variance and covariance of factors, in addition to factor loadings, to be equal among age groups in Model 3. As shown in **Table 3**, Model 3 fit the data quite well. Comparison between Model 3 and Model 2 showed that constraints of factor variance and covariance did not significantly lower the goodness of fit, $\Delta\chi^2 = 12.55$, $\Delta df = 6$, $p > .05$. The results suggested that Model 3 was preferable to Model 2, revealing cross-age structural invariance, i.e., the variances of latent factors and their relationship were equivalent across age groups.

Invariance of Factorial Structure across Cultures

Likewise, cross-cultural invariance of the two-factor, eight-item structure was tested among younger German, US, and Hong Kong adults. As displayed in **Table 2**, indices showed good model fit in all these samples, indicating the same configural pattern of structure across cultures.

As displayed in **Table 3**, Model 5 (with factor loadings constrained to be equal across groups) was not different in terms of goodness-of-fit compared to Model 4 (with factor loadings freely estimated), $\Delta\chi^2 = 19.56$, $\Delta df = 12$, $p > .05$. The results suggested that Model 5 was preferable to Model 4, revealing cross-cultural measurement invariance, i.e., the pattern of the relationship between items and factors was equivalent across cultural groups. Model 6 (with both factor loadings and covariances constrained to be equal across groups) was not different in terms of goodness-of-fit compared to Model 2, $\Delta\chi^2 = 3.87$, $\Delta df = 2$, $p > .05$. The results suggested that Model 6 was preferable to Model 5, revealing structural invariance, i.e., the relationship between latent factors was equivalent across cultural groups.

----------Insert Table 2 & 3 here----------

Discriminant and Convergent Validity

As displayed in **Table 4**, social motivations did not significantly correlate with respondents' education, income, physical health, or life satisfaction, supporting the discriminant validity of the questionnaire.

Concerning convergent validity, age negatively correlated with IS motivation (r = -.14, p < .01). Further, although the correlation between age and ER motivation did not reach significance, age positively correlated with the ER-IS difference (r =.16, p < .05), indicating an age-related prioritization of ER over IS motivation. Curvilinear regressions revealed a negative linear relationship between age and IS motivation (β = -.14, t = -3.14, p = .002; R^2 = .02, F = 4.98, p = .007), a positive linear relationship between age and ER-IS difference (β = .16, t = 3.58, p < .001; R^2 = .03, F = 6.38, p = .002), and no linear or curvilinear relationship between age and ER motivation (ps > .10).

FTP negatively correlated with ER motivation and the ER-IS difference, suggesting that limited FTP increases the relative weight of ER motivation. ER and ER-IS difference, in turn, negatively correlated with negative social support, and ER also positively correlated with social satisfaction. In addition, both ER and ER-IS difference negatively correlated with the number of very close social partners, number of close partners, number of less close partners, and total number of partners in the core social network, except for the correlation between ER-IS difference and the number of close partners (r = -.09, p = .06) which was not significant. These results suggest that greater prioritization of ER goals is associated with more compact social networks and better quality of social relations.

Depression, finally, was positively associated with ER goals, suggesting that those with depressed mood pursue social motivations aimed at promoting well-being. In combination, these results support the convergent validity of the current questionnaire[2].

----------Insert Table 4 here----------

Discussion and Conclusion

In the current study, we developed the two-factor, eight-item Social Motive Questionnaire (SMQ; see Table 5) to measure motivation for social interaction. The questionnaire exhibited satisfactory reliability and validity. We also confirmed cross-age and cross-cultural structural invariance of the questionnaire, indicating that it can be applied to different age groups and different cultures.

SMQ is the first questionnaire to discerns two different types of social motivation—IS and ER motivation, which have been implicated in age-related changes in social interaction. The difference between these two types of motivation captures the prioritization of ER over IS motivation. Consistent with Socioemotional Selectivity Theory (SST) (Carstensen, 1995), the relative preference for ER goals was positively associated with age. Specifically, this effect appeared to be driven by lower IS motivation but preserved ER motivation in older as compared to younger adults.

[2] We also screened for personality traits using the Big Five Inventory (John & Srivastava, 1999). Consistent with prior evidence indicating that personality influences individuals' social attitudes and behaviors, which in turn relate to social motivation (e.g., Asendorpf & Wilpers, 1998; Pratto, Sidanius, Stallworth, & Malle, 1994), we found small but significant associations between individual traits (average $|r| = .13$).

SST further asserts that age-related changes in social motivations are associated with FTP (Carstensen, 1995; Reed & Carstensen, 2012). In alignment with this assertion, we found that those with more limited time horizons reported stronger ER motivation and a higher prioritization of ER over IS goals. The former studies usually found that older adults (with greater ER motivation) reported smaller social networks (particularly fewer socially-distant partners) but comparable numbers of close partners (Antonucci et al., 2004; Fung et al. 2001; Smith et al., 2015; Zhang et al., 2011), as well as higher better quality of social relations (Lang & Carstensen, 2002; Zhang et al., 2011), compared to younger adults (with greater IS motivation). These findings suggest negative correlations between ER motivation and social network size, and positive correlations between ER motivation and quality of social relations. Our results were generally in line with this literature by finding that endorsement of ER goals and a stronger prioritization of ER over IS goals were associated with smaller social networks, less negative social support, and more positive social satisfaction) of social relations.

Our results also showed negative correlations between ER motivation (and ER-IS difference) and the number of very close and close social partners, which seems inconsistent with the findings from the former studies. However, we found no significant relation between social motivation (IS and ER) and proportion of close or very close partners in the core social network (see Table 4), suggesting that the relative number, instead of the absolute number, of (very) close partners maintained when social motivation shifted in the current study. The inconsistency might be due to the factor that the data used in the current study were cross-sectional. Personal networks are more stable and change more slowly over time compared to personality and social motivation (Asendorpf & Wilpers,1998). It is possible that age-related changes in social motivation had not been fully reflected in social network characteristics yet in

our data. Future studies should test whether ER and IS will predict subsequent changes in personal networks according to SST.

Finally, depressive symptoms were associated with an endorsement of ER motivation, but—in contrast to age, future time horizons, and network size—depressive scores were not significantly associated with the relative preference of one type of motivation over the other. Future research is desired to systematically explore the associations of social motivation with a wider range of variables including aspects of personality traits.

One limitation of the current study is that we included a multi-age sample from Germany, but only younger adult samples from the US and Hong Kong. It would have been preferable to also include middle-aged and older US and Hong Kong samples. However, we would like to point out that the US and Hong Kong samples were merely recruited to establish cross-cultural invariance, which could be considered a supplement to the main contribution of our study—the establishment of SMQ and its reliability and validity, which was based on the multi-age German sample. Note also that there is no theoretical reason to expect cross-cultural variations in age-related shifts of social goals (e.g., Fredrickson & Carstensen, 1990; Fung & Carstensen, 2006; Fung, Carstensen, & Lang, 2001; Fung, Carstensen, & Lutz, 1999; Fung, Lai, & Ng, 2001; Lang & Carstensen, 1994, 2002), which would have necessitated the recruitment of multi-age international samples. In conclusion, despite the limitation, the current study contributes to the literature by developing a scale SMQ to measure IS and ER motivation in the context of social interaction, and by providing sufficient evidence supporting the reliability and validity of the scale.

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Table 1

Loadings of Items on Factors Yielded by Exploratory Factor Analyses

Item	Structure 1		Structure 2	
	IS	ER	IS	ER
1. It is important for me to spend time with people who know about topics that I know very little about.	.77	-	.79	-
4. At this point in my life it is important for me to contact knowledgeable persons.	.79	-	.81	-
6. Few things are more interesting than meeting new and different people.	.48	-	.48	-
8. I seek out people who stimulate me to think about new things.	.57	.43	excluded	
9. I like to be with people who challenge my intellect.	.70	-	.69	-
2. I seek contact with people who accept me the way I am.	-	.62	-	.62
3. It is important to me to be able to express my feelings without offending others.	.42	.41	excluded	
5. I spend most of my time with people whom I feel very close.	-	.71	-	.74
7. I need to be with people who give my life a sense of meaning.	-	.71	-	.72
10. At my age there should always be someone around with whom there is a sense of mutual understanding.	-	.47	-	.48

Note. Sample size $N = 238$; Exploratory factor analysis (EFA) with Varimax (orthogonal) rotation was performed on all ten items in Structure 1, and on eight items with item 3 and 8 excluded due to the cross-loading problem in Structure 2; IS: information-seeking social motivation; ER: emotion-regulatory social motivation; Factor loadings lower than .40 are not

presented; EFA with Promax (oblique) rotation yielded the same structural pattern, with correlational coefficient $r = .33$ between IS and ER.

Table 2

Goodness-of-fit Indices of Structural Equation Models in Different Age Groups

Age groups	χ^2, *df, p*	χ^2/ *df*	NNFI	CFI	RMSEA (90% CI)
German younger	28.91, 19, .07	1.52	.88	.92	.06 (0, .10)
German middle-aged	18.74, 19, .47	.99	1.00	1.00	<.001 (0, .07)
German older	28.30, 19, .08	1.49	.92	.95	.07 (0, .11)
US younger	26.94, 19, .11	1.42	.92	.94	.05 (0, .09)
Hong Kong younger	26.29, 19, .12	1.38	.95	.96	.05 (0, .10)

Table 3

Goodness-of-fit Indices of Models Testing for Cross-Age and Cross-Cultural Invariance

Model	χ^2, *df, p*	χ^2/ *df*	NNFI	CFI	RMSEA (90% CI)
Cross-age invariance					
Model 1	75.95, 57, .05	1.33	.93	.95	.03 (0, .04)
Model 2	84.67, 69, .10	1.23	.95	.96	.02 (0, .04)
Model 3	97.22, 75, .04	1.30	.94	.94	.03 (.01, .04)
Cross-cultural invariance					
Model 4	71.13, 57, .10	1.25	.94	.96	.03 (0, .05)
Model 5	90.69, 69, .04	1.31	.93	.94	.03 (.01, .05)
Model 6	94.56, 71, .03	1.33	.93	.94	.03 (.01, .05)

Note. In Model 1, no parameter was cross-group constrained; in Model 2, factor loadings were constrained to be equal among age groups; in Model 3, factor loadings, as well as variance and covariance of latent factors were constrained to be equal among age groups. In Model 4, no parameter was cross-group constrained; in Model 5, factor loadings were constrained to be equal among age groups; in Model 6, factor loadings, as well as covariance of latent factors were constrained to be equal among groups (constraints on variance would significantly worsen goodness of fit).

Table 4

Correlational Coefficients (*r*) between Social Motivation and Other Measures

	1	2	3
1. IS	1		
2. ER	.28**	1	
3. ER – IS	-.65**	.55**	1
4. Age	-.14**	.05	.16**
5. Future time perspective	.001	-.11*	-.09*
6. Number of very close partners	-.07	-.24**	-.12**
7. Number of close partners	-.03	-.14**	-.09
8. Number of less close partners	-.01	-.18**	-.13**
9. Total number of partners in the circles	-.05	-.24**	-.15**
10. Very close-to-total ratio	-.06	-.08	-.01
11. Proportion of close partners	-.01	-.06	-.06
12. Negative social support	.07	-.10*	-.14**
13. Social satisfaction	.07	.12*	.03
14. Depression	.05	.14**	.06
15. Education	.01	-.03	-.03
16. Log (income)	.03	.04	.01
17. Physical health	-.04	-.002	.04
18. Life satisfaction	.02	-.05	-.06

Note. * $p < .05$, ** $p < .01$; sample size $N = 480$; IS: information-seeking social motivation; ER: emotion-regulatory social motivation, ER – IS = ER motivation minus IS motivation.

Table 5. Social Motivation Questionnaire

Instruction: Read the statements below. For each statement, please judge how much do you agree with it according to your own situation. Shade the oval under the appropriate number on the scale, where 1 means “very disagree” and 7 means “very agree.”

Item	1	2	3	4	5	6	7
1. It is important for me to spend time with people who know about topics that I know very little about.	○	○	○	○	○	○	○
2. I seek contact with people who accept me the way I am.	○	○	○	○	○	○	○
3. At this point in my life it is important for me to contact knowledgeable persons.	○	○	○	○	○	○	○
4. I spend most of my time with people whom I feel very close.	○	○	○	○	○	○	○
5. Few things are more interesting than meeting new and different people.	○	○	○	○	○	○	○
6. I need to be with people who give my life a sense of meaning.	○	○	○	○	○	○	○
7. I like to be with people who challenge my intellect.	○	○	○	○	○	○	○
8. At my age there should always be someone around with whom there is a sense of mutual understanding.	○	○	○	○	○	○	○

Note. IS = information-seeking social motivation; ER = emotion-regulatory social motivation. The total score of item 1, 3, 5, and 7 measure the level of IS motivation, with a higher score indicating stronger IS motivation; the total score of item 2, 4, 6, and 8 measure the level of ER motivation, with a higher score indicating stronger ER motivation.

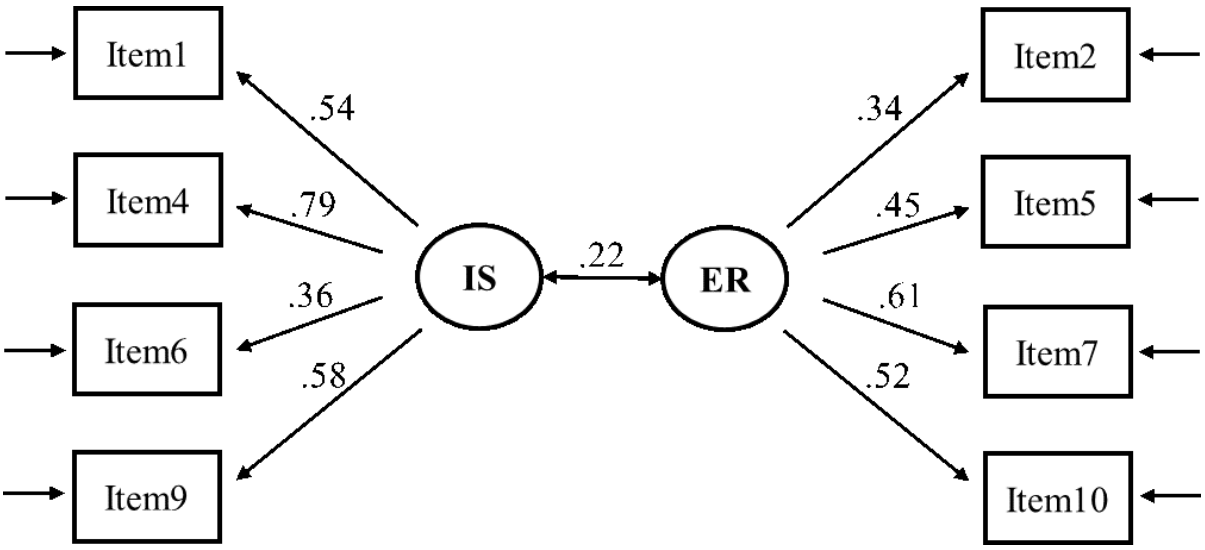

Figure 1. Structural equation model for the short version of Social-motivation Questionnaire. IS = information-seeking social motivation; ER = emotion-regulatory social motivation.